Corps Aviation Brigade Deep Operations: Toward a Sharper Spear

A Monograph
by
Major Lester C. Jauron
Field Artillery

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

First Term AY 92-93

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
		MONOGRAPH

4. TITLE AND SUBTITLE
CORPS AVIATION BRIGADE DEEP OPERATIONS : TOWARD A SHARPER SPEAR

5. FUNDING NUMBERS

6. AUTHOR(S)
MAJ LESTER C. JAURON, USA

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
SCHOOL OF ADVANCED MILITARY STUDIES
ATTN: ATZL-SWV
FORT LEAVENWORTH, KANSAS 66027-6900
COM (913) 684-3437 AUTOVON 552-3437

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
SEE ATTACHED

14. SUBJECT TERMS
AVIATION; CORPS AVIATION BRIGADE; DEEP OPERATIONS THEORY; DEEP OPERATIONS; DEEP OPERATIONS DOCTRINE; ATTACK HELICOPTERS; JOINT FORCE AIR COMPONENT COMMANDER (JFACC)

15. NUMBER OF PAGES
58

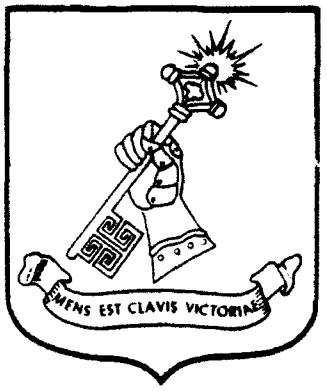
16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED

Corps Aviation Brigade Deep Operations: Toward a Sharper Spear

A Monograph
by

Major Lester C. Jauron
Field Artillery



School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

First Term AY 92-93

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Lester C. Jauron

Title of Monograph: Corps Aviation Brigade Deep Operations: Toward a Sharper Spear

Approved by:

Patrick V. Donahue

LtCol Patrick Donahue, MA — Monograph Director

James R. McDonough

COL James R. McDonough, MS — Director, School of Advanced Military Studies

Philip J. Brookes

Philip J. Brookes, Ph.D. — Director, Graduate Degree Program

Accepted this 19th day of December 1992

ABSTRACT

CORPS AVIATION BRIGADE DEEP OPERATIONS: TOWARD A SHARPER SPEAR by MAJ Lester C. Jauron, USA, 58 pages.

This monograph analyzes corps aviation brigade doctrine, and its supporting organization, equipment, and control arrangements, to determine if it enables the aviation brigade to conduct successful deep operations. Doctrine is the centerpiece of this analysis.

The monograph first examines the evolution of current corps aviation brigade doctrine, organization, equipment, and command and control arrangements. It then discusses the influence of doctrine on the other three factors. Next, the monograph describes deep operations theory and its implications for the corps aviation brigade. It then uses deep operations theory to analyze aviation brigade deep operations during Operation Desert Storm and recent Battle Command Training Program (BCTP) rotations.

This analysis reveals that corps aviation brigade deep operations doctrine is inadequate because it does not enable the brigade to access continuous target acquisition and project a sustained threat. Recommendations for improvement include: giving the brigade responsibility for planning/executing aviation deep operations; describing how to use support available from the Joint Force Air Component Commander (JFACC); updating fire support doctrine to provide close support and interdiction fires; and providing detailed doctrine for exploitation and pursuit operations. These recommendations will enable the corps aviation brigade to better meet its theoretical potential as a deep operations maneuver force.

Table of Contents

SECTION I. INTRODUCTION

Operation Desert Storm showed the aviation brigade is one of the corps commander's most effective deep operations assets. The Battle of the Causeway, during which aviation units cut off the last escape route of Iraqi units out of Kuwait, and the air assault into forward operational base (FOB) Cobra demonstrated the aviation brigade's ability to destroy enemy forces in depth and create favorable conditions for future battles and engagements.[1] By using deep operations theory to examine these experiences it may be possible to improve corps aviation brigade employment doctrine. When combined with corresponding improvements to organization, equipment, and command and control arrangements, these changes could make the corps aviation brigade a better deep operations asset.

In the absence of a threat, theory becomes increasingly important. Operation Desert Storm marked a watershed for our Army. Prior to this operation the Army was able to focus against clearly defined threats - first the Soviet Union and then the Iraqis. After Desert Storm this focus became less clear. The lack of a threat prevents the Army from creating a doctrine to capitalize on the vulnerabilties of a specific enemy. In essence, theory must substitute for the Soviet Red Army by projecting the nature of future threats. The Army uses theory to translate its experiences, and the experiences of others, into a realistic view of the future.[2] Although theory asserts nothing, it indirectly influences the way the Army fights by serving as the basis for doctrine.[3]

Doctrine shapes the way the Army fights. It is "the condensed expression of our fundamental approach to fighting..."[4] The Army's organization, equipment, and command and control arrangements are all based on doctrine. Although peacetime doctrine is never exactly right, it must not be too far wrong if an army is to fight effectively.[5] The key is to be close enough to reality to adapt quickly during wartime.[6] This wartime adaptation is extremely difficult.[7] Replacing poor equipment fielded because of a flawed doctrine takes time while changing a dysfunctional command and control system can be extremely difficult.

This monograph analyzes if current corps aviation brigade doctrine, as well as its supporting organization, equipment, and command and control arrangements, enables the aviation brigade to conduct successful deep operations. The focus is short term and the monograph assumes current helicopter models will be used for the foreseeable future.

The monograph concludes current corps aviation brigade employment doctrine is inadequate because it does not permit the aviation brigade to access continuous and accurate target acquisition and project a sustained threat. It recommends several doctrinal changes to increase the tempo of corps aviation brigade deep operations: shifting responsibility for planning and controlling aviation brigade deep operations from the corps main command post to the aviation brigade headquarters; linking the aviation brigade headquarters into the Joint Force Air Component Component's (JFACC's) command and control system; changing fire support doctrine to provide responsive fire support to the aviation brigade; and expanding the doctrine for

conducting deep operations to support exploitation and pursuit operations.

The monograph's structure is as follows. Section II gives a short history of the attack helicopter, traces the evolution of the current aviation brigade doctrine, organization, equipment, and command and control arrangements and provides an overview of recent experiences from the Battle Command Training Program (BCTP) and Operation Desert Storm. Section III provides a theoretical basis for answering the research question. It describes the relationship between doctrine, organization, equipment, and command and control, and shows how this relationship affects corps aviation brigade doctrine. Next it discusses the development of deep operations theory, describes each of its components, and provides the implications of deep operations theory on corps aviation brigade deep operations. Section IV uses theory to analyse recent corps aviation brigade deep operations. The battlefield operating systems (BOS) is the framework for this analysis. Section V recommends changes to corps aviation brigade doctrine to make the it a more effective deep operations asset. It then recommends corresponding changes to organization, equipment, and command and control arrangements. Section VI, the conclusion, summarizes the discussion and recommendations.

SECTION II. BACKGROUND

The role of the attack helicopter has evolved considerably since its introduction during the Vietnam War.[8] In Vietnam the attack helicopter was primarily a

fire support platform.[9] In the late 1970s, Active Defense doctrine transformed the attack helicopter into an anti-armor platform. With the advent of AirLand Battle doctrine, attack helicopters began to be viewed as a maneuver weapon system with a deep operations role.[10] During Operation Desert Storm attack helicopters performed a variety of missions and conducted several extremely successful deep operations.[11] These operations showed attack helicopter units can get inside the enemy commander's decision cycle and increase tactical tempo.

During the Vietnam War attack helicopters were primarily fire support platforms. The first attack helicopter was the AH-1 Cobra. The Cobra was a modified UH-1 armed with rockets, machine guns, and 40mm grenades.[12] It escorted unarmed helicopters and provided devastating close support fires for ground units.[13] Although the lightly armored Cobra took heavy losses, it earned a reputation as an extremely dependable close air support platform.[14]

After Vietnam the attack helicopter evolved into an anti-armor platform. The Active Defense doctrine of the mid-seventies focused exclusively on the threat of a massed armor attack by Warsaw Pact forces in Europe.[15] The Cobra was armed with tube launched, optically tracked, wire guided (TOW) missiles to allow it to destroy Warsaw Pact tanks.[16] Several studies were conducted to determine how to organize and employ attack helicopter units. As a result of these studies, attack helicopter units were given three roles: anti-armor; aerial fire support; and

reconnaissance and security. Of these the anti-armor role was considered most important.[17]

Aviation organizations evolved rapidly to meet these roles. A Combat Aviation Battalion with two attack helicopter companies was fielded in each division.[18] In the early 1980s this battalion was replaced by the Cavalry Brigade Air Attack.[19] This robust organization included two attack helicopter battalions, a cavalry squadron, and a combat support aviation battalion. Its mission was to "find, fix, and destroy enemy armored and mechanized forces using fire and maneuver."[20] An Air Cavalry Combat Brigade with an air cavalry squadron and two attack battalions was fielded at corps. This brigade was designed to find armored formations with its cavalry squadron and kill them with the attack battalions.[21] These organizations enabled attack helicopters to perform their primary role; killing enemy armored vehicles in the close fight.[22]

The publication of AirLand Battle Doctrine in 1982 changed the way attack helicopters were employed. One of the biggest shortcomings of the Active Defense was its inability to cope with uncommitted second echelon forces.[23] As a result, one of the centerpieces of the new doctrine was the deep operation. Deep operations were defined as "...activities directed against enemy forces not in contact designed to influence the conditions under which future close operations would be fought."[24] This focus on deep operations, combined with the creation of the aviation branch, and the introduction of the AH-64 Apache advanced attack helicopter, changed aviation's battlefield role.[25] Although attack helicopters could still augment the fires

of infantry and armor, they would also be employed as maneuver weapon systems to attack second echelon formations.[26]

The Army refined aviation brigade organizations, control arrangements, and doctrine to make deep operations successful. The 1984 Army of Excellence study (AOE) was commissioned to establish a force structure that supported AirLand Battle doctrine.[27] One of the goals of the study was to upgrade the combat capabilities of the corps without increasing end strength or reducing the capability of divisions to perform their missions on the AirLand Battlefield.[28] As a result, the division Cavalry Brigade Air Attack was reorganized into a smaller Combat Aviation Brigade and additional attack helicopter battalions were added to the new Corps Combat Aviation Brigade.[29] These refinements gave the corps enough attack helicopters to simultaneouely augment division Combat Aviation Brigades and conduct deep operations for the corps commander.

Currently aviation brigades at division, corps, and echelons-above-corps (EAC) provide unity of command for all aviation assets.[30] Divisional brigades have one to four attack helicopter battalions (each with 18 AH-64s or 21 AH-1s). Corps brigades have two attack groups with two to four attack battalions (each with 18 AH-64s). The EAC brigade has a flexible structure with a variable number of attack battalions but is normally smaller than the corps brigade. Aviation brigades at each level also control a variety of command, assault, and medium helicopter units.[31]

Improved equipment gives the corps aviation brigade the ability to conduct deep operations and survive. The AH-64 is a much better aircraft than the AH-1. It has two engines, additional armor, improved night-fighting capability, and better anti-armor weapons.[32] The AH-64 can use stealth to get across the Forward Line Own Troops (FLOT) during periods of limited visibility and inflict tremendous damage on enemy forces in the objective.[33] The new OH-58D Kiowa observation helicopter and UH-60 Blackhawk utility helicopter complement the AH-64's enhanced capabilities.[34] These new helicopters give the corps aviation brigade the ability to get across the FLOT, accomplish its mission, and survive.

Command and control for corps aviation brigade deep operations is highly centralized. The corps main command post (CP) controls the aviation brigade deep attack as a collateral operation.[35] The corps main CP is responsible for synchronizing the activities of the aviation brigade with those of other corps units, adjacent units, EAC supporting assets, and the assets of supporting services.[36]

Corps aviation brigade employment doctrine recognizes aviation deep operations are combined arms operations that must be highly synchronized and tightly controlled to be successful.[37] Doctrine dictates that the corps aviation brigade focuses on deep operations at night while the division aviation brigades concentrate on conducting close operations during daylight.[38] This is logical because the corps has more intelligence assets, quicker access to intelligence from EAC, more attack helicopters, better

communications, and a larger command and control structure than the divisions.

There are three sources of corps aviation brigade deep operation employment doctrine: FM 100-15, Corps Operations; FM 1-111, Aviation Brigades; and the Corps Deep Operations Handbook. FM 100-15, Corps Operations describes probable targets for aviation brigade deep attacks but gives no detailed guidance for conducting these operations.[39] It gives the corps main CP's current operations cell responsibility for controlling deep air maneuver operations.[40] Additionally, it states that the commander of a deep maneuver force is usually given an area of operations in which he controls all aspects of the battle.[41] FM 1-111, Aviation Brigades devotes four pages of text and six pages of illustrations to corps aviation brigade deep operations. These describe why corps aviation brigades conduct deep operations and give some considerations for conducting them. Additionally, FM 1-111 contains a forty page appendix describing a corps aviation brigade deep operation against a second echelon tank division. This appendix is almost identical to the description of aviation brigade deep operations found in the Corps Deep Operations Handbook and provides detailed procedures for conducting deep operations.

FM 1-111, Aviation Brigades and the Deep Operations Handbook describe the aviation deep attack as a six phase operation: preparation, penetration, movement to the objective, actions at the objective, return, and restoration. Each phase requires extensive staff planning

and coordination at every level to make the deep operation succeed.[42]

The preparation phase includes conducting mission analysis, updating the intelligence preparation of the battlefield (IPB), integrating intelligence support into the operation, task organizing the aviation brigade, setting up the command and control arrangements to be used during execution, planning the Joint Suppression of Enemy Air Defenses (J-SEAD), developing the Army Airspace Command and Control plan, and preparing the logistical support for the operation. This phase culminates with the development of an execution matrix which sequences these activities and synchronizes them with the aviation brigade plan.[43] The preparation phase ends with the attack helicopter battalions in their forward assembly areas.[44]

During the penetration phase the attack battalions conduct a forward passage of lines with friendly units on the Forward Line of Own Troops (FLOT) and use a combination of speed, stealth, indirect fires, communications jamming, non-communications jamming, and deception to penetrate into enemy airspace.[45] Since enemy air defenses are thickest near the FLOT, units in contact along the FLOT can assist the attack battalions by conducting feints and attacking enemy air defenses.[46] All involved corps units participate in the planning and coordination to synchronize the operation and preclude fratricide.[47]

During movement to the objective, the corps main CP provides intelligence updates to the attack battalions. The attack battalions must know the locations of enemy air defense concentrations and changes in the location and

posture of the target.[48] The corps main CP processes the combat information it receives from sensors into intelligence and transmits this intelligence to the attack battalions quickly enough for them to effectively react.[49] Maintaining a communications link between the attack battalions and the corps main CP becomes difficult with distance and often requires a relay system.[50]

Actions at the objective include intelligence collection at the objective, target engagements, and fire distribution/control. As the attack battalions close on the objective the priority of the intelligence collection effort shifts to updating the location and status of the target.[51] The attack battalions have several options when engaging the target. They can use some helicopters to designate while the others engage or all the helicopters can both designate and engage.[52] The attack battalions use well-defined procedures to maximize the number of kills while minimizing the effects of enemy fires. These procedures allow the attack battalions to quickly destroy the target while minimizing friendly losses.[53]

After accomplishing its mission, the aviation brigade uses a different route to return to friendly lines. During the return phase the attack battalions break contact, withdraw from the objective area, and move along egress routes to passage points along the FLOT.[54] After conducting the rearward passage of lines, the attack battalions move to holding areas and cycle through the forward arming and refueling point (FARP). The helicopters use on-board aircraft survivability equipment (ASE) and identification friend of foe (IFF) systems to protect

themselves during egress.[55] While the attack battalions withdraw, sensors conduct battle damage assessment (BDA) to determine the effect of the attack.[56]

The last phase of the deep operation is reconstitution. During this phase the attack battalions perform postflight checks, conduct debriefings, and move to assembly areas in the corps rear. Combat service support (CSS) prepares the battalions to conduct future operations.[57] Intelligence sensors focus on determining the results of the attack and the enemy commander's reaction. It will be 24-48 hours before the attack battalions can participate in another deep operation.[58] During this time the attack helicopter battalions recover and the corps staff assesses the results of the attack and plans the next operation.[59]

FM 1-111 describes three types of deep operations corps aviation brigades conduct to facilitate exploitation and pursuit. These are operations of limited duration, operations to secure deep objectives, and operations to continue the attack. Operations of limited duration resemble raids or ambushes. They focus on destroying enemy forces, damaging key facilities, or deceiving the enemy as to the location of the main attack.[60] Operations to secure deep objectives are deliberate attacks to occupy terrain in the enemy's rear. These operations require a linkup with friendly ground maneuver forces.[61] Operations to continue the attack exploit successful corps or division battles and prevent the enemy from reconstituting his defense.[62]

These three operations seem to be an afterthought to FM 1-111. Each is accorded one paragraph which describes the operation but gives no details about how to execute it. Additionally, there are several illustrations showing possible graphical control measures for each operation.[63]

The Battle Command Training Program (BCTP) and Operation Desert Storm provide experiences for testing the effectiveness of corps aviation brigade doctrine and its supporting organization, equipment, and command and control arrangements. BCTP is a training vehicle for corps, division, and brigade commanders and their staffs. It features a computer-driven command post exercise (CPX) against a "thinking and reacting" opposing force.[64] Operation Desert Storm was the first test of the current corps aviation brigade deep operations doctrine, organization, equipment, and command and control arrangements on a medium intensity battlefield.

During BCTP corps aviation brigades have learned the importance of intelligence preparation of the battlefield (IPB) and the difficulty synchronizing aviation brigade deep operations. IPB is vital because it allows the corps staff to focus its intelligence effort and gives the aviation brigade the information it needs to avoid enemy air defenses.[65] Synchronizing the operation is difficult because of the number of agencies involved, the distances by which they are separated, and the need to move information from one agency to another quickly during execution.[66] Characteristically, a corps headquarters plans and executes one aviation brigade deep operation during a BCTP rotation. They are unable to pull together

another because of helicopter losses and the difficulty synchronizing these operations.[67]

During Operation Desert Storm aviation brigades conducted many successful deep operations in a very permissive environment. The ineffectiveness of Iraqi air defenses, the efficiency of the joint targeting complex, and the availablity of JFACC controlled electronic warfare systems allowed attack helicopter units to go across the FLOT without extensive preplanning.[68] Aviation brigades quickly abandoned the classic deep operation with its hours of preparation and extensive intelligence requirements and changed tactics to take advantage of the situation.[69]

The two most decisive aviation deep operations of Desert Storm were the 101st Division's air assault into forward operational base (FOB) Cobra and the Battle of the Causeway. Both showed the effectiveness of the revised deep operations tactics. The 101st Division's air assault was one of the most significant operational maneuvers of the war. By the end of the first day the CH-47s and UH-60s had delivered 131,000 gallons of fuel and tons of ammunition into Cobra. By the next day the combat elements of the corps and division were conducting deeper air assaults.[70] During the Battle of the Causeway two aviation brigades from XVIII Airborne Corps cut the last escape route of Iraqi mechanized forces from the Kuwaiti Theater of Operations (KTO) and destroyed hundreds of Iraqi vehicles.[71] During this battle the 24th Aviation Brigade fired 107 Hellfire missiles and scored 102 hits from so far away the Iraqis could not see them.[72]

SECTION III. THEORY

Theory offers insights to help analyze corps aviation brigade deep operations employment. In The Evolution of Modern Land Warfare, Christopher Bellamy describes the interrelationships between the "four key elements of war:" doctrine; equipment; organization; and command and control.[73] He concludes doctrine is usually the most important element because it has such a strong influence on the other three.[74] This establishes the importance of both corps aviation brigade deep operations doctrine and the research question.

In his many writings, Richard Simpkin discusses the development of deep operations theory, describes each of its components, and provides several concepts with profound implications for aviation brigade doctrine. According to Simpkin, an effective deep operations force must accelerate the operation's tempo and get inside the enemy's decision cycle.[75] To do this, the deep operations force must be linked to accurate and continuous target acquisition and be able to project a sustained threat.[76] By implication, aviation brigade deep operations doctrine must allow it to access accurate and continuous target acquisition, and enable it to project a sustained threat.

In The Evolution of Modern Land Warfare Christopher Bellamy describes four key elements in the conduct of war. These are military art (strategy, operational art, tactics), technology, logistics/organization, and command, control, communications, and information (C3I).[77] At the tactical level these equate to doctrine, equipment, organization, and command and control. Although at times

one (or more) of these factors may be more important than the others, it is by skillfully combining them that the commander gains a relative advantage over the enemy.[78]

Of these four key elements technology is usually the least important determinant of victory.[79] There are three reasons for this. The first is that technological advantages are usually very fleeting because the other side quickly develops similar systems.[80] The second is that the other side eventually develops countermeasure to negate technological disadvantages. The third is that new technology is seldom effectively assimilated into existing doctrine, organizations, and command and control arrangements.[81]

While technology is often the least important of the four factors, doctrine is usually the most important.[82] Since doctrine describes the way an army wants to fight, it is the basis for the organizational structure and command and control system an army adopts. Perhaps even more importantly, doctrine shapes the collective values of an army. The way the army views itself, measures its effectiveness, and solves problems is a direct reflection of its doctrine.[83]

The German invasion of France in 1940 showed that a superior doctrine effectively linked to organizational structure and command and control arrangements can be decisive. German doctrine advocated using massing mechanized formations to generate superior operational tempo and destroy the equilibrium of the enemy's defense. To support this doctrine, the German force structure kept the mechanized forces together rather than distributing

them evenly throughout the army. The German command and control system enabled German units to operate at a high operational tempo by encouraging subordinates to use their own initiative to accomplish missions within the overall scope of the higher commander's plan.[84] Thus, the German Army's doctrine, organization, and command and control system were tigtly linked and allowed them to make the best possible use of their limited mechanized resources.[85]

Tight linkages between German doctrine, organizational structure, and command and control systems allowed the Germans to structure the campaign to their advantage. During this campaign the allies had more men, more tanks, more artillery, prepared fortifications, and all of the advantages inherent to the defense.[86] The only material advantage enjoyed by the Germans was a larger Air Force that was highly effective in providing close air support to the maneuver units.[87] The Germans nullified allied material advantages by setting such a high operational tempo that the allies were never able to effectively react. The Germans always had the initiative. They used their one material advantage, the Luftwaffe, to help them break through the allied defenses at Sedan.[88] After that the high German operational tempo prevented the allies from translating their material superiority into battlefield combat power. As a result, the Germans rapidly surrounded the allied forces in Belgium and northern France making a French capitulation inevitable.[89]

The relationship between doctrine and technology is more fluid. Doctrine both shapes and is shaped by technology. In essence, technology defines what is

possible while doctrine delineates how the army chooses to develop these possibilities. Although armies nearly always exploit available technologies, doctrine affects the choices an army makes when translating these technologies into the equipment the army uses in combat.[90] By implication if doctrine is too far wrong the army's equipment may be inadequate to do the job.

The development of U.S. Army tanks in World War II shows how doctrine affects equipment design. At this time doctrine viewed the armored force as the successor to the cavalry. According to doctrine, armored divisions were exploitation forces and did not fight other armored formations.[91] As a result, the 1944 armored divisions were primarily armed with the M-4 Sherman tank. This tank was mobile and reliable but was far inferior to German tanks in protection and firepower. Even after facing superior Panthers and Tigers in Sicily and Italy, Army Ground Forces sabotaged efforts by the Ordanance Department to develop more powerful and protected tanks.[92] Only three months before the Normandy invasion Army Ground Forces relented and permitted the development of the T-26 Pershing tank. These did not arrive in quantity until after the Battle of the Bulge.[93] As a result, American armored units had to depend on superior numbers to defeat German tanks. According to General Bradley, "this willingness to expend Shermans offered little comfort to the crews who were forced to expend themselves as well."[94]

An effective doctrine often allows a technologically inferior army to turn its technological shortcomings into an advantage. Low technology techniques, such as

dispersion, frequent movement, using terrain effectively, and using guerrilla tactics can be very effective against a high technology force. By using these techniques, the low technology army can create favorable conditions for battle by using the enemy's technology against him. The Chinese did this against the United States in November 1950. By using rugged terrain to hide their forces the Chinese were able to mass 30 divisions in Korea and attack the roadbound Americans with overwhelming numbers.[95]

There must be firm linkages between doctrine, equipment, organization, and command and control arrangements if an army is to perform to maximum effectiveness.[96] This is easier said than done because each of these factors involves many hard choices.[97] Doctrine is usually the most important factor because it expresses how the army wants to fight and sets the tone for the other factors. However, the equipment, organization, and command and control arrangements must make the doctrine achievable and must be consistent with the overall concept.[98]

The development of the Blitzkrieg shows the difficulty involved in developing an effective doctrine and establishing the necessary linkages with equipment, organization, and command and control arrangements. The success of the German invasion of France was a direct result of changes made to fix problems with the linkages that the Germans experienced in Poland.[99] Even then the Germans eventually lost the war, largely because their enemies had superior resources and were eventually able to

overcome initial German advantages in doctrine, organization, and command and control systems.

Bellamy's theory has several implications for the corps aviation brigade. The first is that the Army must have the proper doctrine for the corps aviation brigade and the brigade's equipment, organization, and command and control arrangements must be consistent with this doctrine. Although no peacetime doctrine is perfect, the aviation brigade's doctrine should be close enough to reality to be rapidly adapted to the wartime situation. The second implication is since technological advantages are usually fleeting, we must continuously modify aviation brigade doctrine to compensate for likely enemy countermeasures and to get the full benefit of emerging technologies. Based on the Iraqi experience in Desert Storm, any potential enemy will develop systems or tactics to negate the AH-64s technological advantages. In the future the results we attain with this system will be based on the effectiveness of our employment rather than on technological surprise.

Although deep operations have always been possible it was the industrial revolution that made them worthwhile. The industrial revolution changed the nature of war by shackling the armies to an umbilical cord of supply. Prior to the 19th century armies could carry all the ammunition they needed for an entire campaign. As long as the army was able to find food for the men and fodder for the horses it was able to continue fighting.[100] The industrial revolution allowed nations to raise huge armies that consumed huge amounts of ammunition, food and fodder. This forced armies to continuously resupply and to develop large

infrastructures to distribute these supplies.[101] By attacking deep it became possible to dislocate the enemy by disrupting his supply system.

At the same time technical developments changed the shape of the battlefield. The rifled musket, the breech loading rifle, the magazine, smokeless powder, and eventually the machine gun, successively created a more lethal and dispersed battlefield. This made it extremely difficult to control formations on the increasingly empty battlefield.[102]

Tactical transportation and communications systems did not improve to offset the changes in the nature of the battlefield. The railroad and the telegraph allowed higher level commanders to move masses of men and material into the theater but the increased lethality, command and control difficulties, and slow rates of tactical movement made it extremely difficult to achieve a battlefield breakthrough and virtually impossible to exploit one if it occurred.[103]

Since it was almost impossible to achieve or exploit a breakthrough, armies used dispersed formations and envelopments to pin enemy armies, envelop them, and cut them off from their sources of resupply. Moltke applied this operational concept during the Franco-Prussian War and captured the two largest French armies.[104] However, by 1914 the armies were too large for this technique to work. After the failure of the Schlieffen plan, World War I developed into a massive deadlock. Although the German 1918 offensives were highly successful, their slow tactical tempo allowed the Allies to blunt the attacks, conduct a

series of counteroffensives, and force the Germans to seek an armistice.[105]

Mechanization seemed to provide a way to break a deadlock of the type experienced in World War I. Visionaries such as J.F.C. Fuller and Basil Liddell Hart wanted to create a totally mechanized force capable of creating breakthroughs and exploiting them to operational depth.[106] The German creators of the blitzkrieg took this approach to its logical extreme by creating essentially two armies within an army -- a fully mechanized force built around the Panzer Divisions and a totally foot mobile force with almost no mechanization at all.[107] Although initially successful, mismatchs between ends and means, flawed linkages between doctrine, organization, equipment, and command and control arrangements, and well-armed opponents with equally effective doctrines, led to German defeat.[108]

During the 1930s a group of Soviet officers, led by Marshal Mikhail Tukhachevsky, developed deep operations theory. This theory used the tank and the airplane to break the linear paradigm of World War I by balancing the effects of maneuver and attrition while extending the battlefield in depth. Deep operations theory shattered the coherence of the enemy defense by using two complementary forces. A mass force consisting of infantry, artillery, and tanks pinned the enemy, forced him to commit his reserves, and created a breakthrough. The mobile force then shot through the breakthrough and exploited to operational depth.[109] The mobile force continuously made the enemy react by rapidly placing forces in positions of

great relative advantage. The combination of attrition exacted by the holding force and the successive positional advantages gained by the mobile force caused the enemy to cede the initiative and come off of his plan.[110] The deep operation developed rapidly, outpaced the enemy's ability to react and shattered the coherence of his defense.[111]

Three theoretical concepts lay at the heart of deep operations theory. These are simultaneity, interchangeablity, and tempo. Simultaneity means applying force throughout the entire depth of the enemy formation before the affected unit can respond.[112] Interchangeablity means forces and fires can be freely substituted for each other.[113] Tempo is rate of speed of the operation from the time of the receipt of an order until the operation is completed.[114] Each of these concepts has implications for the corps aviation brigade.

Simultaneity requires the corps commander to apply combat power throughout the depth and within the decision cycle of the opposing formation. The corps aviation brigade is the only asset the corps commander controls that can destroy any target throughout the depth of his battlespace. Although Air Force Battlefield Air Interdiction (BAI) can be highly effective, the corps commander doesn't control it and can't rely on it. The Army Tactical Missile System (ATACMS) can often range the corps commander's entire battlespace but is not designed to kill hard moving targets.[115]

The accuracy of modern target acquisition systems and the lethality of modern weapons is beginning to make fires and maneuver forces interchangable. In the past it was

necessary to place a maneuver force in a position near the target to threaten it. Accurate and continuous target acquisition combined with the inherent mobility of the helicopter permits the aviation brigade to threaten a target without being in close physical proximity. As a result, the aviation brigade, when linked to accurate and continuous target acquisition, can operate within the enemy's decision cycle.[116]

Superior tempo relative to the enemy is the key to getting inside the enemy's decision cycle.[117] Tempo has many components: physical mobility; tactical rate of advance; quality and reliablity of information; command and control timings; times to complete moves; pattern of combat support; and pattern of combat service support.[118] The lead maneuver force usually sets the tempo.

Three conditions must exist for the corps aviation brigade to set the tempo as the lead maneuver force. First, it must have accurate and continuous target acquisition. Second, it must be able to capitalize on this target acquisition to quickly destroy the enemy forces it places at risk. Third, it must be able to quickly recover from one attack and deliver another. If the enemy is allowed to react to the loss of a target he can regain the initiative and stay on plan. In short, to set the tempo the aviation brigade must pose a sustained threat.[119]

SECTION IV. ANALYSIS

The battlefield operating systems (BOS) offer a framework for using theory to analyse recent corps aviation brigade deep operations experiences. The seven BOS include

maneuver, fire support, air defense, command and control, intelligence, mobility/counter-mobility/survivability, and combat service support. Current experiences are derived from Operation Desert Storm and BCTP. The goal is to determine if the corps aviation brigade is capable of reaching its deep operations potential in the near term. This analysis will provide the basis for specific recommendations to corps aviation brigade doctrine, equipment, organization, and command and control arrangements.

Maneuver

Maneuver is defined in FM 100-5 as "...the movement of potent combat forces in relation to the enemy to secure or retain a positional advantage."[120] The commander maneuvers forces in order to keep the enemy off balance, protect the force, and enhance the effectiveness of firepower.[121] To be effective a maneuver force must possess the means to kill the enemy upon arrival at positional advantage, maneuver at a faster tempo (time, space, and mass) than the enemy can counter, be able to adjust to changes in target location, and be capable of sustaining its tempo over time.[122]

Current corps aviation brigade deep operations doctrine makes it virtually impossible for the brigade to be an effective deep operations maneuver force. While current doctrine does allow the aviation brigade to arrive at a positional advantage and maneuver at a faster intitial tempo than the enemy, it makes it extremely difficult to adjust to changes in target location once the deep

operation is underway or sustain the tempo required stay inside the enemy decision cycle.

The difficulty tracking moving targets makes it difficult to trigger the deep operation or react to changes in the direction or location of the threat target array once the helicopters are under way. During the 1992 Command and General Staff College BCTP exercise the corps staff was forced to cancel two aviation brigade deep operations because intelligence sensors were not able to locate the target at the critical time.[123]

The difficulty communicating with the attack battalions after they cross the FLOT makes transmitting changes in the locations of the threat target array problematic. Current doctrine considers the tenuous communications link between the corps main command post and the attack groups as the single greatest challenge to successful deep operations.[124] A potential solution is to attack a non-moving target such as an artillery grouping or a key logistical site when it is impossible to acquire the desired target. However, these target types are technically more difficult to attack and may make the attack battalions more vulnerable to fixed air defenses. In spite of these difficulties, the 7th Infantry Division was extremely successful attacking artillery during their 1991 BCTP rotation.[125] Although this technique makes planning more difficult it does provide flexiblity to the aviation brigade during execution.

According to deep operations theory the aviation brigade can get inside the enemy's decision cycle if it is linked with continuous and accurate target acquisition.[126]

Although doctrine assumes this will be difficult, it happened during Desert Storm. The reason was the aviation brigade's ability to link into joint intelligence assets such as Joint Surveillance Target Attack Radar System (J-STARS).[127]

Current corps aviation brigade deep operations doctrine makes it very difficult to generate superior tactical tempo and project a sustained threat. The 24-48 hours required to recover after one mission and plan the next gives the enemy time to successfully react to each deep attack. The doctrine does not address ways to compress this cycle. During Operation Desert Storm aviation brigades compressed the cycle by using joint intelligence assets such as
J-STARS to track targets and avoid concentrations of enemy troops. As a result, aviation brigades were able to sustain tempo by maneuvering deep much more often than was envisioned by doctrine.[128]

Fire Support

Fire support doctrine is insufficient to support aviation brigade deep operations. FM 6-20-30, Fire Support for Corps and Division Operation focuses exclusively on providing suppression of enemy air defenses (SEAD) and fires to support the joint air attack team (JAAT). Although the manual recognizes the primary mission of attack helicopter units is to destroy armor and mechanized units in combined arms operations, it does not give the detail needed provide responsive fire support support to the aviation brigade.[129] Excluding SEAD and JAAT, there

is more discussion of using attack helicopters as fire support than providing fire support for attack helicopters.[130]

The aviation brigade's fire support requirements during deep operations are not limited to SEAD/J-SEAD or JAAT. When aviation assets are employed in deep operations they are a maneuver force. As a maneuver force they require close support and interdiction fires.[131] According to FM 100-5, "When maneuver forces have missions such as raids, deep attacks, or covering force operations which take them beyond supporting distance of the main body, commanders must make special provisons for their support."[132]

The fire support structure is insufficient to support the corps aviation brigade. The Corps Artillery Heaquarters Battery Table of Organization and Equipment does not provide fire support elements to the brigade or group headquarters. It does provide a fire support officer and non-commissioned officer for five attack helicopter battalions.[133] The lack of fire support personnel at brigade and group forces these units to depend on the corps fire support element to plan their fires.

The artillery force structure does not provide a habitually associated direct support field artillery battalion to the corps aviation brigade.[134] Although the nature of the aviation brigade operations often makes this appropriate, FM 6-20-30 compounds the problem by not describing how to provide responsive fire support to the aviation brigade when it is needed. It describes the following method for providing responsive fires to a deep

maneuver force. "When the deep attack force has outdistanced the MBA artillery, organic mortars, accompanying artillery, and CAS provide most of the fire support for the force." [135] Since the aviation brigade has no organic mortars or accompanying artillery, it is unclear how fire support will be provided if CAS is not available.

The lack of a real time interface with the JFACC's airspace management system was another fire support problem experienced by artillery and aviation units in Desert Storm.[136] This made it difficult for the corps aviation brigade to capitalize on the effects of J-SEAD and prevented artillery units from rapidly coordinating their fires with the JFACC.

Shortfalls in fire support structure and doctrine make it difficult for the corps aviation brigade to sustain sufficient tempo to get inside the enemy's decision cycle. Responsive fire support is extremely important to attack helicopter units because they depend on a combination of speed, maneuverability, and threat avoidance to offset their inherent vulnerabilities. When attack helicopters are acquired by the enemy, suppressive fires can be the difference between survival and destruction. Extended range Multiple Launch Rocket System (MLRS) and the Army Tactical Missile System (ATACMS) allow artillery to suppress the enemy air defenses and maneuver forces the aviation brigade encounters while enroute to its objective.

Air Defense

The most logical enemy for an attack helicopter is another attack helicopter. Some theorists believe massed

helicopter battles may be a fixture on future battlefields.[137] Soviet helicopters such as the Hokum have an air-to-air capability.[138] To counter this threat, the Army fielded the Air to Air Stinger System (ATAS). Desert Storm marked the battlefield appearance of this system.

During Desert Storm 66 OH-58C helicopters were equipped with ATAS. During deep operations, Stinger-armed OH-58Cs trailed attack helicopters and provided air defense and command and control support.[139] Although OH-58Cs are not as capable as the Apaches, they were able to operate freely because the JFACC quickly established air superiority. Although no Army air-to-air engagements took place during Desert Storm, aviation units gained valuable experience fielding and training with the ATAS system.[140]

Several conclusions can be drawn from theory and the Desert Storm experience. First, attack helicopters must be prepared to defend themselves against enemy attack helicopters. Second, the Joint Force Air Component's battle for air superiority determines whether this threat will materialize. Third, the self-defense measures aviation units take should be consistent with the threat and should not divert too much combat power from other missions.

Command and Control

According to the 1992 preliminary draft of FM 100-5 command and control are two separate functions. It defines command as, "the art of motivating and directing soldiers and their organizations into action to accomplish missions."[141] Command has two vital components. These

are deciding and leading.[142] Control is defined as, "the science of computing requirements, allocating means, and integrating efforts."[143] Control supports command by removing detail from the commander and giving him the information he needs to decide and lead. Command occurs from the location of the commander; control usually emanates from command posts.[144]

According to FM 100-5, the need for flexibility is greatest for the committed maneuver commander. He must know the intent of the commander two levels up, the responsibilities of the units supporting the operation, and act freely to accomplish the mission with minimal guidance.[145] The corps aviation brigade commander lacks this flexibility because the corps main CP plans and controls his deep operations. However, technology will soon allow the aviation brigade CP to access the intelligence it needs to plan and control deep operations.

The current stucture of the corps aviation brigade does not provide the commander with the support he needs to control his operations. By definition this interferes with his ability to effectively command. The first shortcoming is the size of the aviation brigade staff. The 13 man operations staff and five man intelligence staff is unable to concurrently control one operation and plan another.[146] During Desert Storm corps commanders made several attempts to mass divisional and corps aviation brigades against lucrative targets. These attempts were hampered by the small size of the corps aviation brigade staff.[147]

Communications present the greatest biggest challenge for an aviation brigade deep operation.[148] This results

from the extreme distances involved in these operations and the number of agencies whose actions must be coordinated to make a deep attack succeed. During Desert Storm aviation brigades used OH-58Cs as communications relay platforms. This would not be a viable option in a high air defense threat environment because of the OH-58C's limitations, the lack of a forward looking infrared (FLIR) system, and the height at which they must fly to perform this function.

Another factor diminishing the brigade commander's flexibility is the lack of a suitable standardized airborne CP from which he can exercise command during execution. During Desert Storm some brigade commanders commanded from an AH-64 while others used a UH-60.[149] Although how a commander exercises command is his perogative, the reason for this discrepancy was the lack of a suitable facility. The Apache allowed the commander to stay in the fight at the price of not being able to communicate effectively with other agencies. With the UH-60, the commander risked not getting into the fight because this helicopter lacks a Forward Looking Infrared (FLIR) system to enable it to fly low and fast at night.[150]

The other command and control problem experienced during Desert Storm was the lack of a real-time interface with the computer system used to build and disseminate the air tasking order (ATO).[151] The sheer size of the ATO, usually over 1000 pages of text, made it imperative to get it as soon as possible.[152] This kept aviation brigades from getting timely information about Joint SEAD, airspace control measures, and Airborne Command Control and Communications (ABCCC) platforms.

The ponderous command and control process used to plan and control aviation brigade deep operations makes it difficult to get inside the enemy's decision cycle and provide a sustained threat. Improvements in target acquisition, communications, and information processing systems may allow the aviation brigade CP to plan and control aviation brigade deep operations. Decentralization would simplify planning, make execution more flexible, and would allow the corps commander to employ his aviation brigade like he employs his other maneuver units.

Intelligence

The corps aviation brigade depends on accurate and timely intelligence about enemy air defenses, maneuver forces, and target arrays to conduct a successful deep operation. Intelligence preparation of the battlefield, the commander's priority intelligence requirments, and the targeting process drive the intelligence collection and dissemination effort. Currently, the intelligence needed to conduct aviation brigade deep operations is collected from a variety of sources and fused in the corps main CP. This intelligence is then integrated into the deep operation planning and passed to the aviation brigade once the operation is underway.[153]

During Operation Desert Storm Air Force command and control platforms - the E-3 Airborne Warning and Control System (AWACS), E-8 J-STARS, and EC-130E ABCCC III provided quick and accurate intelligence and targeting information to the corps headquarters. They also directed aircraft to attack these targets and provided communications relays when needed. These highly automated platforms processed

large amounts of information and tailored it to the needs of the receiving element.[154] During the 1990s systems will be fielded to allow Army units at every level to access this information in near-real time. These systems are but one component of an intelligence technical revolution that has profound implications for the corps aviation brigade.

The intelligence technical revolution will allow the corps aviation brigade to continuously access information about enemy air defenses, maneuver units, and target arrays. Systems the corps aviation brigade will be able to access in near-real time include: national signals intelligence (SIGINT), electronic intelligence (ELINT), and imagery intelligence (IMINT) assets; Air Force command and control platforms; Army airborne and ground based signals intelligence (SIGINT) and electronic intelligence (ELINT) collectors/jammers; and automated fused all-source intelligence on the enemy, weather and terrain.

The specific elements of this revolution include the Guardrail Common Sensor, the Unmanned Aerial Vehicle (UAV), Tactical Exploitation of National Capabilities (TENCAP) SIGINT, ELINT, and IMINT dissemination systems, J-STARS Ground Station Modules (GSMs), Ground Based Common Sensors (GBCSs), Advanced Quickfix (AQF), and the All Source Analysis System (ASAS). Each of these systems has been fielded or will be fielded by the end of the 1990s.[155] These systems will collect, process, and disseminate intelligence in near-real time. This will give the aviation brigade flexibility by allowing it to continuously

access information about enemy air defenses, maneuver units and target arrays.

According to deep operations theory, the corps aviation brigade can be an effective deep maneuver force if it can get inside the enemy's decision cycle and generate sufficient tempo to project a sustained threat. However, the aviation brigade needs continuous and accurate target acquisition to do this. The intelligence revolution will make this a reality. It will also allow the corps aviation brigade commander to be a true maneuver commander by giving him the flexiblity to fight his unit without constant direction from higher headquarters.[156]

Moblity, Countermobility, Survivablity

The greatest advantage of the helicopter is its mobility and freedom from enemy countermobility efforts. However, the helicopter sacrifices survivablity to gain mobility. This means the attack helicopter is vulnerable to a variety of threats. These threats include enemy air defense guns, surface to air missiles, artillery, and maneuver forces. Historically the helicopter's greatest threats are infrared missiles and fires from ground maneuver systems.[157]

According to doctrine, attack helicopters combat these threats in a variety of ways. They fly low to avoid being acquired by the radars that track and acquire targets for longer range missiles and some short range guns. They fly during periods of limited visibility so they cannot be acquired or engaged by maneuver forces or artillery. They use fires from artillery and electronic warfare (EW) jamming to suppress enemy air defense radars and

communications. Although the Army has no organic radar jamming capability, it sometimes exploits the effects of JFACC controlled jamming. Lastly, helicopters employ aircraft survivability equipment (ASE) to detect radars, infrared systems, and lasers. These systems suppress the aircraft's signature and provide a return signal to the threat acquisition system that causes the weapon to miss.[158] During Desert Storm these techniques were very effective. ASE was a great success and the Army lost only one UH-60 and one AH-64 to enemy fire during the entire operation.[159] During Desert Shield the aviation community upgraded the ASE on nearly all of the helicopters and trained the crews to use it.[160] This equipment allowed helicopters to avoid enemy radar sites and caused nearly all the missiles and guns fired at helicopters to miss.[161]

To get inside the enemy commander's decision cycle and generate superior tactical tempo the aviation brigade's helicopters must be survivable. ASE must be continuously upgraded based on the capabilities of threat air defense systems. Since the conflict between ASE and a threat acquisition system is a battle between technologies, a marginal advantage can be decisive.[162] Additionally, the corps aviation brigade must be able to exploit the effects of the intelligence revolution to destroy, neutralize, suppress or avoid enemy air defenses and maneuver units. It should be able to access the ATO and exploit JFACC intelligence, target acquisition, and radar suppression.

Combat Service Support (CSS)

The corps aviation brigade depends on the corps support groups (CSGs) from the COSCOM for direct support (DS) and general support (GS).[163] This CSS is task organized to support the mission and employed in echelon to provide flexibility and responsiveness. Forward arming and refueling points (FARPs) serve as the combat trains for the aviation units and are normally placed just out of medium artillery range.[164] Field trains are located further back and contain the bulk of the aviation unit's support.

The corps aviation brigade consumes a tremendous amount of Class III (bulk fuel) and Class V (ammunition). Doctrinally, corps assets deliver class III (bulk fuel) to the corps aviation brigade. The brigade may coordinate to have this class III delivered directly to the FARP.[165] The brigade draws its Class V (ammunition) from an ammunition transfer point (ATP) in a division area or an ammunition supply point (ASP). It uses its own assets to move this ammunition to the FARP or field trains.[166] In essence, the brigade is sustained using a push system.

During Desert Storm, VII Corps augmented its aviation brigades with additional cargo and fuel trucks to allow logistical support to keep pace with the operation. For example, each attack battalion in 1st Armored Division received six cargo Heavy Expanded Mobility Tactical Trucks (HEMMTs) and six fuel HEMMTs.[167] Even then brigades had difficulty sustaining themselves because of the difficulty locating aviation fuel in the corps rear area.[168] In essence, the push system envisioned in doctrine became a pull system after the crossing of the line of departure.

XVIII Airborne Corps used a different approach. On the first day of the ground war it established forward operating base (FOB) Cobra 70 miles into Iraq. By the end of G+1 the CH-47s and UH-60s had moved 131,000 gallons of fuel and enough ammunition for the next day's fight into FOB Cobra. By the end of G+2 the 101st Division had 380,000 gallons of fuel in Cobra, had air assaulted one brigade into the Euphrates River Valley, and had ordered two attack battalions to move 200 km east to FOB Viper.[169]

Responsive logistical support is key to getting inside the enemy's decision cycle and generating the superior tactical tempo needed to project a sustained threat. During Desert Storm the aviation brigades used several means to do this. The VII Corps augmented its attack battalions with additional trucks.[170] The XVIII Corps used helicopters to establish massive FOBs inside Iraq.[171] Both methods were appropriate based on the nature of the opposition each corps faced. The conclusion is that commanders and their logisticians must be flexible and work together to provide responsive logistical support.

SECTION V. RECOMMENDATIONS

This section makes specific recommendations to corps aviation brigade employment doctrine based on the analysis presented in Section IV. This section then discusses the changes to equipment, organization, and command and control needed to needed to make the doctrinal recommendations work. Deep operations theory defines the criteria for each recommendation. The criteria are that each recommendation facilitate generating superior tactical tempo to get inside

the enemy's decision cycle and allow the corps aviation brigade to project a sustained threat.

Doctrine

As technology improves, doctrine should direct the corps aviation brigade CP to plan and control aviation brigade deep operations. Current capablities make it necessary to plan and control these operations from the corps main CP. This leads to a synchronized operation that takes far too long to orchestrate. With the advent of real-time and near-real-time intelligence collection, processing, and dissemination, the corps aviation brigade should plan and execute these operations. Corps should still provide the mission, intent, assets, and some graphical controls. The brigade should coordinate directly with the JFACC, corps artillery, and corps military intelligence brigade for J-SEAD. Perhaps the Army Airspace Command and Control (A2C2) element should also operate from the aviation brigade command post. Decentralization would increase tempo by cutting the planning time for aviation deep operations and providing flexibility during execution.

FM 1-111, Aviation Brigades should describe, in detail, the support available from the JFACC and how to tap into this support. The aviation brigade misses many target acquisition, command and control, and air defense suppression opportunities because doctrine does not describe how to exploit them.[172] This in no way implies the JFACC should control the corps aviation brigade. It does imply that the corps aviation brigade can get certain information from the JFAC without diverting JFAC assets from their its ongoing missions.

Fire support manuals such as FM 6-20-30, Fire Support for Division and Corps Operations should be updated to reflect aviation's status as a maneuver force. Excluding the discussions of SEAD and JAAT, FM 6-20-30 devotes more discussion to using the attack helicopter to provide fire support than it does describing how to provide fire support to attack helicopters.[173] Although the nature of the aviation brigade's mission may preclude providing a direct support artillery battalion, FM 6-20-30 should discuss how to meet the brigade's close support and interdiction requirements when it is conducting deep maneuver.

FM 1-111, Aviation Brigades should devote more discussion to conducting deep operations to support exploitation and pursuit operations. These include operations of limited duration, operations to secure deep objectives, and operations to continue the attack. Currently FM 1-111 devotes less than two pages of text and four pictures to these operations.[174] Future changes should expand this discussion by giving options for cutting planning time that can be modified based on the situation.

Equipment

Continue fielding real-time and near-real-time intelligence collection, processing, and dissemination systems. These systems will allow the corps aviation brigade to get inside the enemy's decision cycle by increasing the tempo of aviation brigade deep operations. These systems will do this in three ways. First, they will provide continuous target acquisition so the brigade can direct itself onto the target and react to changes in target location. Second, they will enhance the brigade's

ability to suppress or avoid threat air defenses and maneuver units. And third, these systems will shorten the planning and execution cycles by making it easier to plan deep operations and providing flexibility during execution.

Field a system to allow the corps aviation brigade to access the ATO. This will permit the aviation brigade to take advantage of JFACC radar suppression, command and control systems, and target acquisition. Some will argue this could lead to attack helicopters being placed on the ATO. During Desert Storm this happened.[175] However, the CINC will normally base this decision on his assessment of the situation and doctrine rather than connectivity. Like aircraft in Marine Air Ground Task Force (MAGTF), the corps aviation brigade is an integral part of the unit to which it is assigned. By placing attack helicopters under the JFACC's control the CINC risks degrading the capabilities of a subordinate unit to accomplish a mission that does not affect that unit. The importance of the mission may justify taking this risk but the CINC must carefully consider the possible long term consequences.

Field a standard command and control aircraft for aviation battalion, group, and brigade commanders and operations officers. Ideally this should by a UH-60 with FLIR, UH-670 command and control console, automatic target handover system (ATHS), and extended range fuel tanks.[176] This will allow the aviation commander to get into the fight and synchronize his operation during execution.

Provide the corps aviation brigade with the equipment it needs to man a main command post. This command post should be robust enough to plan a future operation, conduct

an ongoing operation, and coordinate with other agencies for SEAD. Since the corps aviation brigade is a maneuver force, its CP should be robust enough to control other attached maneuver units.

Continue improving aircraft survivablity equipment. This is one area where being second best is never good enough. The biggest problem with ASE is the changing nature of the threat and the wide variety of systems owned by our potential adversaries. It may be necessary to develop a number of ASE configurations based on various threat technologies and update each aircraft's ASE when a specific threat materializes.[177]

Organization

The structure of the corps aviation brigade should be expanded to allow it to plan a future operation, execute an ongoing operation and man a main command post (CP). It should also be able to man a ground tactical CP if the commander elects not to control an operation from the air. As the command post of a maneuver unit, the brigade CP structure must also be able to provide command and control to attached maneuver units.

Related to this is the requirement for the corps aviation brigade and group headquarters to have fire support elements. This would allow the aviation brigade to synchronize indirect fires into its scheme of maneuver and would provide the artillery with targeting information and the ability to link the OH-58Ds to artillery assets.

Command and Control

Decentralizing the command and control of aviation brigade deep operations will present significant challenges

to the corps staff, the aviation brigade staff, and combat support units in the corps. Exact procedures should be defined to reduce confusion. Exercises such as BCTP should be used to test the effectiveness of the concept and the Center for Army Lessons Learned (CALL) should disseminate ideas that work to other commands. Theory strongly supports decentralizing aviation brigade deep operations. However, theoretical concepts must be translated from doctrine to practice with great care to ensure that they are in synch with reality.

SECTION VI. CONCLUSIONS

Current corps aviation brigade employment doctrine and its supporting equipment, organization, and command and control arrangements do not enable the aviation brigade to successfully conduct deep operations. Deep operations theory suggests an effective deep operations force must be able to get inside the enemy's decision cycle and project a sustained threat. Current doctrine is far too centralized to generate the tempo required to do this. The combination of a flexible employment doctrine and accurate and continuous target acquisition will allow the aviation brigade to make the required increase in tempo.[178]

During Operation Desert Storm, aviation brigades received accurate and timely target acquisition from a variety of sources not considered in doctrine.[179] This allowed aviation brigades to modify doctrine to get inside the enemy decision cycle and project a sustained threat.

Based on these experiences and the results of the intelligence technical revolution, several changes should

be made to corps aviation brigade employment doctrine to make the brigade a potent deep operations force. These include: shifting responsibility for planning aviation deep operations to the aviation brigade; providing, in detail, the support available from the JFACC and the ways to get this support; changing fire support doctrine to provide responsive close support and interdiction fires to the aviation brigade; and expanding the doctrinal discussion of deep operations designed to support exploitation and pursuit operations.

Changes to corps aviation brigade equipment and organization must support these recommended changes to doctrine. Additionally, ASE should be continuously updated based on the nature of the threat and consideration should be given to the human dimensions of decentralizing corps aviation brigade deep operations.

These changes could make the corps aviation brigade an effective deep operations force capable of accomplishing the role envisioned for it in theory. Future developments in technology will offer even better ways to increase the tempo of aviation deep operations. The Army should take advantage of these opportunities so that our experience will be one of analysing our successes rather than analysing the successes of our adversaries against us.[180]

ENDNOTES

1. U.S. Army Aviation Center, Aviation in Desert Shield/Storm (Draft), (Fort Rucker AL: U.S. Army Aviation Center, 1991) pp. 12-18.

2. James J. Schneider, "The Eye of Minerva: The Origin, Nature, and Purpose of Military Theory and Doctrine," (Theoretical Paper Number 5, School of Advanced Military Studies, 1992) p. 19.

3. Ibid., pp. 18-19.

4. U.S. Army, Field Manual 100-5, Operations (Preliminary Draft), (Fort Leavenworth, KS, August 1992), p. 1-1.

5. Michael Howard, "Military Science in an Age of Peace," Chesney Memorial Gold Medal Lecture, 3 October 1973, p. 60.

6. Ibid., p. 59.

7. Stephen P. Rosen, Winning the Next War, (Ithica, NY: Cornell University Press, 1991), pp. 22-39.

8. Hans Halberstadt, Army Aviation, (Novato, CA: Presidio Press, 1990), p. 54.

9. Ibid., p. 56.

10. U.S. Army, Field Manual 100-5, Operations, (Washington, DC: Department of the Army, 1986), pp. 42-43.

11. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 26.

12. Halberstadt, Army Aviation, p. 54.

13. Shane M. Deverill, "Bridging the Gap for the Operational Commander: Hunting Relocateable Ballistic Missiles with Advanced Attack Helicopters," (MMAS Thesis, US Army Command and General Staff College, 1992), p. 2.

14. Halberstadt, Army Aviation, p. 54.

15. U.S. Army, Field Manual 100-5, Operations, (Washington, DC: Department of the Army, 1977), pp. 1-2.

16. Halberstadt, Army Aviation, p. 56.

17. U.S. Army Combined Arms Development Activity (CACDA) (Provisional), Organization and Employment of Attack Helicopters, Final Report, Executive Summary (Fort Leavenworth, KS: Department of the Army, 1973), pp. 28.

18. U.S. Army, Field Manual 1-15, Aviation Reference Data, (Washington, DC: Department of the Army, 1977), pp. 315-321.

19. U.S. Army, Field Manual 71-100, Armored and Mechanized Infantry Division and Brigade Operations (Coordinating Draft), (Fort Leavenworth, KS: U.S. Command and General Staff College (USCGSC), 1983), p. C-35.

20. Ibid., p. C-35.

21. U.S. Army, Field Manual 1-15, Aviation Reference Data, pp. 178-179.

22. U.S. Army, Field Manual 100-5, Operations, (Washington, DC: Department of the Army, 1977), p. 2-21.

23. John L. Romjue, From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973-1982, (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 1984), p. 25.

24. U.S. Army, Field Manual 100-5, Operations, (Washington, DC: Department of the Army, 1986), p. 19.

25. Halberstadt, Army Aviation, pp. 56-57.

26. U.S. Army, Field Manual 100-5, Operations, (Washington, DC: Department of the Army, 1986), pp. 42-43.

27. U.S. Army, Field Circular 100-1, The Army of Excellence, (Fort Leavenworth, KS: Combined Arms Development Activity, 1984), pp. 1-1 - 1-4.

28. Ibid., p. 5-1.

29. U.S. Army, Field Manual 1-111, Aviation Brigade (Final Draft), (Fort Rucker, AL: U.S. Army Aviation Center, 1985), p. C-2.

30. U.S. Army, Field Manual 1-111, Aviation Brigades, (Washington, DC: Department of the Army, 1990), p. 1-1.

31. Ibid., pp. 1-3 - 1-11.

32. Halberstadt, Army Aviation, pp. 64-74.

33. Ibid., pp. 64-74.

34. Ibid., p. 116.

35. U.S. Army, Training and Doctrine Command (TRADOC), Corps Deep Operations Handbook, (Fort Leavenworth, KS: Combined Arms Combat Development Activity (CACDA) Program Integration Office - Tactical

Missile Defense/Deep Operations/Reconnaissance, Intelligence and Target Acquisition, 1990), pp. 3-10 - 3-11.

36. Ibid., p. 3-11.

37. MG Ellis D. Parker, "Aviation Cross-FLOT Operations," Army Aviation 38, (July 31, 1989), p. 6.

38. U.S. Army, Field Manual 1-111, Aviation Brigades, p. 3-40.

39. U.S. Army, Field Manual 100-15, Corps Operations, (Washington, DC: Department of the Army, 1989), p. 3-7.

40. Ibid., p. C-0.

41. Ibid., p. 3-1.

42. TRADOC, Corps Deep Operations Handbook, p. 4-34.

43. Ibid., pp. 4-34 - 4-51.

44. Ibid., p. 4-50.

45. U.S. Army, Field Manual 1-111, Aviation Brigades, pp. J-31 -J-33.

46. MG Ellis D. Parker, "Aviation Brigade Cross-FLOT Operations," p. 66.

47. U.S. Army, Field Manual 1-111, Aviation Brigades, p. J-31.

48. Ibid., p. J-33.

49. TRADOC, Corps Deep Operations Handbook, pp. 4-41 - 4-43.

50. Ibid., pp. 4-41 - 4-43.

51. U.S. Army, Field Manual 1-111, Aviation Brigades, p. J-36.

52. Ibid., p. J-36.

53. Ibid., p. J-36.

54. Ibid., p. J-38.

55. Ibid., p. J-37.

56. Ibid., p. J-38.

57. Ibid., p. J-39.

58. Ibid., p. J-39.

59. Ibid., p. J-39 -J-40.

60. Ibid., p. 3-34.

61. Ibid., pp. 3-44 -3-45.

62. Ibid., p. 3-45.

63. Ibid., pp. 3-46 - 3-49.

64. CPT Shane M. Deverill and CPT Michael S. Marlow, "Aviation Lessons Learned at the Combat Training Centers," U.S. Army Aviation Digest, 1-91-5 (September/October 1991), p. 2.

65. Ibid., pp. 3-4.

66. Center for Army Lessons Learned, "Extracts from BCTP FERS for Deep Battle Research." (Research Inquiry, Center for Army Lessons Learned, 1992), p. 3.

67. Ibid., pp. 1-10.

68. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 26.

69. Ibid., p. 26.

70. Ibid., pp. 26-27.

71. Ibid., pp. 26-27.

72. Ibid., p. 26.

73. Christopher D. Bellamy, The Evolution of Modern Land Warfare: Technology and Practice, (London, Rountledge Press, 1990), pp. 11-13.

74. Ibid., p. 45.

75. Richard E. Simpkin, Deep Battle: The Brainchild of Marshal Tukhachevskii, (London: Brassey's Defence Publishers, 1987), pp. 253 and 258-261.

76. Ibid., p. 269.

77. Bellamy, Evolution of Land Warfare, pp. 11-13.

78. Ibid., p. 11.

79. Ibid., p. 12.

80. Ibid., p. 33.

81. Ibid., p. 38.

82. Ibid., p. 45.

83. Rosen, Winning the Next War, p. 131.

84. Alistair Horne, To Lose a Battle: France 1940, (London, Penguin Books, 1969), pp. 78-85.

85. COL Patrick J. Bodelson and CPT Kevin B. Smith, "Design for Tempo - Part I," U.S. Army Aviation Digest 1-91-2, (March/April 1991), pp. 5-7.

86. Ibid., pp. 5-7.

87. Horne, To Lose a Battle, p. 220.

88. Ibid., pp. 325-332.

89. Richard E. Simpkin, Race to the Swift: Thoughts on Twenty-First Century Warfare, (London: Brassey's Defence Publishers, 1985), pp. 30-31.

90. U.S. Army, Field Manual 100-5, Operations (Preliminary Draft), (Fort Leavenworth, KS: Department of the Army, 1992), p. 1-2.

91. Russell F. Weigley, Eisenhower's Lieutenants: The Campaigns of France and Germany 1944-1945, (Bloomington, IN: Indiana University Press, 1981), p. 19.

92. Ibid., pp. 20-21.

93. Ibid., p. 612.

94. Ibid., pp. 20-21.

95. Clay Blair, The Forgotten War: America in Korea 1950-1953, (New York: Anchor Press, 1987), p. 435.

96. Bruce W. Menning, Bayonets Before Bullets: The Imperial Russian Army 1861-1914, (Bloomington, IN: Indiana University Press, 1992), pp. 243-244.

97. Ibid., pp. 243-244.

98. Bellamy, Evolution of Land Warfare, pp. 30-31.

99. Bodelson and Smith, "Design for Tempo - Part I," pp. 6-7.

100. Martin Van Creveld, Supplying War: Logistics from Wallenstein to Patton, (Cambridge: Cambridge University Press, 1977), p. 57.

101. James J. Schneider, "Vulcan s Anvil: The American Civil War and the Emergence of Operational Art," (Theoretical Paper No. 4, School of Advanced Military Studies, 1991), pp. 46-47.

102. Ibid., pp. 6-18.

103. Ibid., pp. 7-18.

104. Bellamy, The Evolution of Modern Land Warfare, p. 60.

105. Ibid., pp. 78-79.

106. Simpkin, Race to the Swift, pp. 15 17.

107. GEN Ferdinand Senger und Etterlin, "From the Dnepr to the Vistula: Soviet Offensive Operations - November 1943 - August 1944" (U.S. Army War College, Transcript of Proceedings, 1985), p. 598 as quoted in Bodelson and Smith, "Design for Tempo - Part I," U.S. Army Aviation Digest 1-91-2, (March/April 1991), p. 7.

108. Simpkin, Race to the Swift, pp. 33-36.

109. Ibid., pp. 37-39.

110. Ibid., pp. 37-39.

111. Simpkin, Deep Battle, p. 269.

112. Ibid., p. 255.

113. Ibid., p. 258.

114. Simpkin, Race to the Swift, p. 107.

115. U.S. Army Field Artillery Center, Program and Project Summary Sheets, (Fort Sill, OK, Directorate of Combat Developments, 1992), pp. 46-1 - 46-2.

116. Simpkin, Deep Battle, p. 269.

117. Ibid., p. 268.

118. Simpkin, Race to the Swift, p. 106.

119. Simpkin, Deep Battle, p. 269.

120. U.S. Army, Field Manual 100-5, Operations (Preliminary Draft), (Fort Leavenworth, KS: Department of the Army, 1992), p. 2-12.

121. Ibid., p. 2-12.

122. COL Patrick J. Bodelson and CPT Kevin B. Smith, "Design for Tempo - Part II: Aviation as a Maneuver Force," U.S. Army Aviation Digest, 1-91-4 (July/August 1991), p. 5.

123. MAJ Armor D. Brown, interview by author, Fort Leavenworth, KS, 1 Nov 1992. MAJ Brown was chief of 10th (US) Corps Current Operations Cell during Command and General Staff College Exercise Prairie Warrior 1992.

124. TRADOC, Corps Deep Operations Handbook, p. 4-14.

125. COL Kief S. Tackaberry, LTC James A. Kelley, and CPT Thomas A. Muir, "Deep Attack and the Counter-Artillery Battle" U.S. Army Aviation Digest 1-92-1 (January/February 1992), pp. 6-13.

126. Simpkin, Deep Battle, p. 268.

127. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 26.

128. Ibid., p. 26.

129. Richard P. Formica, "Fire Support for the Aviation Brigade (Heavy Division): A Doctrinal Analysis," (MMAS Thesis, U.S. Command and General Staff College, 1990), pp. 113-114.

130. U.S. Army, Field Manual 6-20-30, Fire Support for Corps and Division Operations, (Washington DC: Department of the Army, 1989), pp. 1-4 - 1-7.

131. Formica, "Fire Support for the Aviation Brigade," p. 113.

132. U.S. Army, Field Manual 100-5, Operations (Preliminary Draft), (Fort Leavenworth, KS: Department of the Army, 1992), p. 2-28.

133. U.S. Army, Table of Organization and Equipment (TOE) 06403LO Corps Artillery Headquarters Battery, (Washington DC: Department of the Army, 1989), fiche 9, p. A2.

134. U.S. Army, Field Manual 1-111, Aviation Brigades, p. 4-1.

135. U.S. Army, Field Manual 6-20-30, Fire Support for Corps and Division Operations, p. B-2.

136. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 34.

137. Christopher Bellamy, The Future of Land Warfare, (New York, Saint Martin's Press, 1987), p. 205.

138. GEN Crosbie E. Saint, "Central Europe Battlefield 2000: The Combat Helicopter," Army Aviation 40, (July 31 1991), p. 6.

139. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 38.

140. Ibid., p. 38.

141. U.S. Army, Field Manual 100-5, Operations (Preliminary Draft), (Fort Leavenworth, KS: Department of the Army, 1992), p. 2-15.

142. Ibid., p. 2-15.

143. Ibid., p. 2-16.

144. Ibid., pp. 2-15 - 2-17.

145. Ibid., p. 2-17.

146. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 41.

147. Ibid., p. 41.

148. TRADOC, Corps Deep Operations Handbook, p. 4-41.

149. COL Daniel J. Petrosky and MAJ Marshall T. Hilliard, "An Aviation Brigade Goes to War," U.S. Army Aviation Digest 1-91-5 (Sept/Oct 1991), p. 64.

150. Ibid., p. 64.

151. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 41.

152. Michael R. Macedonia, "Information Technology in Desert Storm," Military Review 72 (October 1992), p. 38.

153. TRADOC, Corps Deep Operations Handbook, pp. 4-24 - 4-62.

154. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, pp. 43-45.

155. U.S. Army, U.S. Army Modernization Plan 1992, (Washington, DC: Department of the Army, 1992), pp. I-32 - I-52.

156. U.S. Army, Field Manual 100-5, Operations (Preliminary Draft), (Fort Leavenworth, KS: Department of the Army, 1992), p. 2-17.

157. U.S. Army, FM 1-101, Aviation Battlefield Survivability, (Washington DC: Department of the Army, 1990), pp. 1-1 - 1-28.

158. Ibid., pp. 1-1 - 1-40.

159. COL Thomas E. Reinkober, "ASE PM Desert Shield/Desert Storm Overview," Army Aviation 40 (31 October 1991), pp. 32-33.

160. Peter McGrew and Craig Searfoss, "Have We Learned a Lesson," Army Aviation 40, (October 31 1991), pp. 41-42.

161. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 45.

162. Mario de Arcangelis, Electronic Warfare: From the Battle of Tsushima to the Falklands and Lebanon Crisis, (Dorset: Blandford Press, 1985), p. 306.

163. U.S. Army, Field Manual 1-111, Aviation Brigades, p. 5-8.

164. Ibid., p. 5-1.

165. Ibid., p. 5-22.

166. Ibid., pp. 5-23 - 5-24.

167. Petrosky and Hilliard, An Aviation Brigade Goes to War, p. 59.

168. Ibid., p. 59.

169. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 32.

170. Petrosky and Hilliard, An Aviation Brigade Goes to War, p. 54.

171. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, pp. 31-32.

172. Ibid., p. 43.

173. U.S. Army, Field Manual 6-20-30, Fire Support for Corps and Division Operations, pp. 1-5 - 1-7.

174. U.S. Army, Field Manual 1-111, Aviation Brigades, pp. 3-44 -3-49.

175. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 41.

176. Ibid., p. 41.

177. William R. Nicholson, "The Changing Threat," Army Aviation 40, (October 31 1991), pp. 43-44.

178. Simpkin, Deep Battle, p. 269.

179. U.S. Army Aviation Center, Aviation in Desert Shield/Storm, p. 43.

180. COL Richard H. Sinnreich, "The Employment of Combat Aviation," (School of Advanced Military Studies White Paper, U.S. Army Command and General Staff College, 1988), p. 17.

BIBLIOGRAPHY

1. Government Publications

US Army. FC 100-1, The Army of Excellence. Fort Leavenworth, KS: Combined Arms Combat Development Activity, 1984.

US Army. FM 1-15, Aviation Reference Data. Washington, DC: Department of the Army, 1977.

US Army. FM 1-101, Aviation Battlefield Survivability. Washington, DC: Department of the Army, 1990.

US Army. FM 1-111, Aviation Brigades (Final Draft). Fort Rucker, AL: US Army Aviation Center, 1985.

US Army. FM 1-111, Aviation Brigades. Washington, DC: Department of the Army, 1990.

US Army. FM 1-112, Attack Helicopter Battalion. Washington, DC: Department of the Army, 1991.

US Army. FM 6-20-30, Fire Support for Corps and Division Operations. Washington, DC: Department of the Army, 1989.

US Army. FM 71-100, Armored and Mechanized Infantry Division and Brigade Operations (Coordinating Draft). Fort Leavenworth, KS: Command and General Staff College, 1983.

US Army. FM 90-15, J-SEAD Multi-Service Procedures for the Joint Suppression of Enemy Air Defensees. Washington, DC: Department of the Army, 1990.

US Army. FM 100-5, Operations. Washington, DC: Department of the Army, 1977.

US Army. FM 100-5, Operations. Washington, DC: Department of the Army, 1986.

US Army. FM 100-5, Operations (Preliminary Draft). Fort Leavenworth, KS: Department of the Army, 1992.

US Army. FM 100-15, Corps Operations. Washington, DC: Department of the Army, 1989.

US Army. Table of Organization and Equipment (TOE) 06403LO, Corps Artillery Headquarters Battery. Washington, DC: Department of the Army, 1989.

US Army. US Army Modernization Plan 1992. Washington, DC: Department of the Army, 1992.

US Army Aviation Center. Aviation in Desert Shield/Storm (Draft). Fort Rucker, AL: US Army Aviation Center, 1991.

US Army Aviation Center Directorate of Combat Developments. Radar Avoidance Techniques. Fort Rucker: US Army Aviation Center, 1989.

US Army Combined Arms Development Activity (CACDA) (Provisional). Organization and Employment of Attack Helicopters, Final Report, Executive Summary. Fort Leavenworth, KS: Department of the Army, 1973.

US Army Command and General Staff College. Aviation White Paper. Fort Leavenworth, KS: School of Advanced Military Studies, 1986.

US Army Field Artillery Center. Program and Project Summary Sheets. Fort Sill, OK: Directorate of Combat Developments, 1992.

US Army Training and Doctrine Command (TRADOC). Corps Deep Operations Handbook. Fort Leavenworth, KS: Combined Arms Combat Development Activity, Program Integration Office - Tactical Missile Defense/Deep Operations/Reconnaisance, Intelligence, and Target Acquisition. 1990.

2. Books

Bellamy, Christopher D. The Evolution of Modern Land Warfare: Technology and Practice. London: Rountledge, 1990.

Bellamy, Christopher D. The Future of Land Warfare. New York: St Martin's Press, 1987.

Blair, Clay. The Forgotten War: America in Korea 1950-1953. New York: Anchor Press, 1987.

de Arcangelis, Mario. Electronic Warfare. Dorset: Blandford Press, 1985.

Halberstadt, Hans. Army Aviation. Novato, California: Presidio Press, 1990.

Horne, Alistair. To Lose a Battle: France 1940. London: Penguin Publishers, 1969.

Menning, Bruce W. Bayonets Before Bullets: The Imperial Russian Army 1861-1914. Bloomingoton, IN: Indiana University Press, 1992.

Romjue, John L. From Active Defense to AirLand Battle: The Development of Army Doctrine 1973-1982. Fort Monroe, VA: US Army Training and Doctrine Command (TRADOC), 1984.

Rosen, Stephen P. Winning the Next War. Ithica: Cornell University Press, 1991.

Simpkin, Richard E. Race to the Swift: Thoughts on Twenty-First Century Warfare. London: Brassey's Defence Publishers, 1985.

Simpkin, Richard E. Deep Battle. London: Brassey's Defence Publishers, 1987.

Van Creveld, Martin. Supplying War: Logistics from Wallenstein to Patton. Cambridge: Cambridge University Press, 1977.

Weigley, Russell, F. Eisenhower's Lieutenants: The Campaigns of France and Germany 1944-1945. Bloomington, IN: Indiana University Press, 1981.

3. Articles

Bodelson, COL Patrick J. and Smith, CPT Kevin B. "Design for Tempo - Part 1." US Army Aviation Digest, 1-91-2 (March/April 1991): 1-16.

Bodelson, COL Patrick J. and Smith, CPT Kevin B. "Design for Tempo - Part 2: Aviation as a Maneuver Arm." US Army Aviation Digest, 1-91-4 (July/August 1991): 2-11.

Bodelson, COL Patrick J. and Smith, CPT Kevin B. "Design for Tempo - Part 3: Aviation - Mobility and Lethality for Deployable Forces." US Army Aviation Digest, 1-91-5 (September/October 1991): 2-12.

Bodelson, COL Patrick J. and Smith, CPT Kevin B. "Design for Tempo - Part 4: Army Aviation and the Counterfire Mission." US Army Aviation Digest, 1-92-1 (January/February 1992): 14-19.

Deverill, Shane M. and Marlow, Michael S. "Aviation Lessons Learned at the Combat Training Centers." US Army Aviation Digest, 1-90-5. (September/October 1990): 2-14.

Macedonia, Michael R. "Information Technology in Desert Storm." Military Review 72 (October 1992): 34-41.

McGrew, LTC Peter and Searfoss, MAJ Craig. "Have We Learned a Lesson," Army Aviation 40 (October 31, 1991): 41-42.

Nicholson, William R. "The Changing Threat." Army Aviation 40 (October 31 1991): 43-44.

Parker, MG Ellis D. "Aviation Cross-FLOT Operations." Army Aviation 38 (July 31 1989): 6 and 66.

Petrosky, COL Daniel J. and Hillard, MAJ Marshall T. "An Aviation Brigade Goes to War," US Army Aviation Digest 1-91-5 (September/ October 1991): 45-65.

Reinkorber, COL Thomas E. "ASE PM Desert Shield/Storm Overview." Army Aviation 40 (31 October 1991): 32-33.

Saint, GEN Crosbie E. and Yates, COL Walter H. "Attack Helicopter Operations in the AirLand Battle: Deep Operations," Military Review 68 (July 1988): 2-9.

Saint, GEN Crosbie E. "Cemtral Europe Battlefield 2000: the Combat Helicopter," Army Aviation 40 (January 31, 1991): 4-7.

Tackaberry, COL Burt S. "24th Aviation Brigade: 'Battle of the Causeway,'" Army Aviation Vol 40 No 7 (31 July 1991): 20-24.

Tackaberry, COL Kief S., Kelley, LTC James A., and Muir, CPT Thomas M. "Deep Attack and the Counterartillery Battle," US Army Aviation Digest 1-92-1 (January/February 1992): 6-13.

4. Unpublished Dissertations, Theses, Papers, Speeches

Bolzak, MAJ Jerry R. "The Role of the AirMechanized Raid in Operational Maneuver," School of Advanced Military Studies (SAMS) Monograph, US Army Command and General Staff College, 1990.

Center for Army Lessons Learned. "Extracts from BCTP FERS for Deep Battle Research," Research Inquiry, Center for Army Lessons Learned, 1992.

Crawford, Darrell E. "Airmechanization: Determining Its Tactical Validity on the AirLand Battlefield," School of Advanced Military Studies (SAMS) Monograph, US Army Command and General Staff College, 1989.

Deverill, Shane M. "Bridging the Gap for the Operational Comander: Hunting Relocateable Ballistic Missiles with Advanced Attack Helicopters," Master of Military Arts and Sciences Thesis, US Army Command and General Staff College, 1992.

Formica, Richard P. "Fire Support for the Aviation Brigade (Heavy Division): A Doctrinal Analysis," Master of Military Arts and Sciences Thesis, US Army Command and General Staff College, 1990.

Howard, Michael. "Military Science in an Age of Peace," Chesney Memorial Gold Medal Lecture, October 3, 1973.

Schneider, James J. "The Eye of Minerva: The Origin, Nature, and Purpose of Military Doctrine," Theoretical Paper No. 5, School of Advanced Military Studies, 1992.

Schneider, James J. "Vulcan's Anvil: The American Civil War and the Emergence of Operational Art," Theoretical Paper No. 4, School of Advanced Military Studies, 1991.

Von Senger und Etterlin, GEN DR F.M. "New Operational Dimensions," from a lecture given at the RUSI on 2 February 1983, RUSI 128 (2 June 1983).

Von Senger und Etterlin, GEN DR F.M. "From the Dnepr to the Vistula: Soviet Offensive Operations November 1943 - August 1944," US Army War College, Transcript of Proceedings, 1985, as quoted in Bodelson and Smith, "Design for Tempo - Part I," US Army Aviation Digest 1-91-2 (March/April 1991): 7.

5. Interview

Brown, Armor D. Interview by the author, Fort Leavenworth, KS, 1 November 1992.